

COMMUNICATIONS RECEIVED SINCE THE END OF THE SESSION.

- I. "Second List of Nebulæ and Clusters observed at Bangalore with the Royal Society's Spectroscope;" preceded by a Letter to Professor G. G. STOKES. By Lieut. JOHN HERSCHEL, R.E. Communicated by Prof. STOKES. Received July 20, 1868.

Bangalore, June 17, 1868.

MY DEAR SIR,—As it is now three weeks since I have been able to make any use of the Royal Society's telescope &c., owing to the setting in of the rainy season, and as circumstances oblige me shortly to move my quarters and start the instruments for the eclipse, it seems better to send all the observations I succeeded in getting since I last wrote up to the time of the change of weather.

I am sorry this second list is not a fuller one. But the fact is, that now that the planetary nebulæ list is exhausted, and the more conspicuous nebulæ, I find no small difficulty in seeing *anything*. It is true that the globular clusters alone form a long list for examination, a considerable number of which may be visible with the spectroscope; but as they seem to show continuous spectra *without exception*, the interest attaching to this class is considerably diminished.

I have still a long list of nebulæ proper to examine; but the proportion of these which exhibit monochromatic spectra seems very small—so small, indeed, that I cannot report a single new instance in this class. There are some conspicuous ones which will present themselves later in the year, among which one or two may possibly be recognizable as gaseous; but the majority, I may say the large majority, seem otherwise, and therefore difficult of positive identification.

It will be necessary to despatch the instruments along with my camp equipage &c. in a fortnight or three weeks, as the spot selected for a station of observation is upwards of 300 miles distant from Bangalore. I cannot expect that the return journey will have been effected before the middle or end of September. For the next three months, therefore, the nebulæ must be allowed to pass unchallenged. Whether I shall have the opportunity of continuing my search then, or not, must depend on circumstances which I cannot now foresee. Should the Society see fit to allow the instrument to remain in my hands for a few months longer, I will at least undertake to prosecute the search during such intervals of leisure as my other duties may leave at my disposal. But at present, perhaps, the question of the disposal of the instrument after the eclipse is not an urgent one.

The station selected for the eclipse observations is Jamkandi (vulg. Jum-khundee), about midway between Belgaum and Sholapore. The selection has been determined chiefly by the small rainfall of that district, and by

the spontaneous offers of assistance of H. H. the Chief of Jamkandi. I have no great fears about the weather ; but of course one may be disappointed. There is certainly a better chance there than at any point on the east coast.

Yours truly,

J. HERSCHEL.

Nos. 2068.

3642.

4132.

4211.

4268.

4270.

4275.

4287.

4296.

4307.

4311.

These are all of the class globular clusters. They are all described as very bright or bright, and most of them well resolved. Their spectra were recognized, without exception, as *continuous*, and that generally without difficulty ; but 2068 and 4211 were very faint in the spectroscope. The spectrum of 4307 was unusually bright, and was visible from about D to about F. No further details appear necessary about these.

The following "planetary nebulae" have been recognized as showing monochromatic spectra :—

No. 1843. Faint monochromatic light at D+2.22 (May 9th).

No. 2076. Faint monochromatic light, distinct, but not measured (May 10th).

No. 1565. Faint monochromatic light, spectrum not seen until the sixth time of examination (May 14th).

No. 1801. Monochromatic spectrum suspected only (May 16th).

No. 3229. "Very bright ; round ; barely resolvable." Spectrum clearly continuous.

No. 3606. "Very remarkable ; very bright ; very large." Continuous spectrum distinctly.

No. 4189. "Bright ; pretty large ; partially resolved." Continued spectrum (May 16th).

No. 4421. "Bright ; small ; well resolved." Continuous spectrum seen pretty easily — ? very bright ; pretty large (May 18th).

No other nebulae have been recognized (since the previous report) as having *positively* either monochromatic light or continuous spectra ; but the following list shows those which are *believed* to be *continuous*.

No. 3227. "Very bright ; large."

No. 3397. "Very bright ; pretty small."

No. 3477. "Very bright ; small ; round ; a star of the 10th magnitude following."

No. 3504. "Very bright ; pretty small ; round."

No. 3706. "Remarkable ; very bright ; very large."

No. 2341. "Bright ; pretty large."

No. 2586. "Bright ; pretty large ; barely resolvable."

No. 3214. "Bright ; pretty large."

The evidence in the case of these is purely negative. They have been brought on the slit with sufficient precision to make it in each case almost a certainty, taking into consideration their apparent brightness, that had their light been monochromatic in the sense in which other similar nebulæ are so, it must have been recognized as such; whereas, if dispersed, analogy would forbid any expectation of detecting the feeble continuous spectrum. In each case I have satisfied myself that the inference was a legitimate one before recording it, both by testing the focal adjustment on a neighbouring star and by repeating (if necessary) the adjustment in respect of direction, until the case appeared a hopeless one.

Some instances, in which the presumption was not so strong as to seem to justify the inference, are omitted from this list.

Several nebulæ, the measurements of whose spectra were given in my previous list, were reexamined. I am rather inclined to believe that the position of the principal light is not quite constant for all. The newer and more careful measurements certainly throw doubts upon some of the earlier ones. Nevertheless I have reason to believe that the discordances are not wholly due to inaccurate determination. But on this and other points I hope to be able to write more fully on a future occasion, when a larger number have been remeasured. The following were reexamined.

No. 4066. Very bright spectrum; 3 lines certainly; faint continuous spectrum suspected.

No. 4510. Very bright spectrum; 2 lines only seen, both hazy; comparatively distinct continuous spectrum of some length on both sides of the principal line.

No. 4390. Seen easily in a bright field; 3rd line seen certainly.

No. 4361. Very large; 2 lines only; ill defined; decided continuous spectrum at the brightest point (*not* stellar).

P.S.—I have throughout used the word “monochromatic” in preference to “linear” intentionally, because, though not *strictly* correct, it appears more so than the latter. Unless a cylindrical lens is used, or unless the object examined is so great as to be partially stopped out by the slit (generally a very wide one), the term “linear” seems purely conventional. I have reason to believe that some of my earlier measures were erroneous, partly through not realizing the “play,” so to speak, of the small image within a wide slit, the *linear* character being illusory. The term has become so intimately associated with spectral appearances, that one is apt to forget how completely *mechanical*, and therefore conventional a characteristic of the quality of light is expressed by it. Thus I find that, in more than one instance, expectation is entertained of possible bright “lines” being seen during the coming eclipse, without the intervention of a slit, as though this were an inherent quality in light itself.